

Illumination Design
and Equipment Data

Engineering Series
AV-1

Certified
by
BENJAMIN

Lighting Equipment

for
**AIRPORTS
AIRPORT
HANGARS
LANDING
FIELDS
AIRWAYS**

Benjamin Electric Mfg. Co.

Des Plaines, Illinois

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TO INSURE the success of night flying as a means of transportation, adequate lighting of airways, airports, hangars and all other facilities is necessary. One entire division of the three subjects considered when rating flying fields or airports is given over to lighting alone. Furthermore, very definite regulations regarding the proper illumination of airports and airways have been formulated by the Aeronautics Branch of the United States Department of Commerce and these are contained in the Department of Commerce Aeronautics Bulletin No. 16 entitled, "Airport Rating Regulations".

In order to obtain the highest rating with respect to lighting equipment, all airports must be provided with the following facilities:

- (a) Beacon Light
- (b) Illuminated Wind Direction Indicator
- (c) Boundary Lights
- (d) Obstruction Lights
- (e) Hangar Flood Lights
- (f) Ceiling Projector
- (g) Field Flood Lights
- (h) All night operation of lighting equipment
- (i) Night personnel

The same general provisions apply to areas which are used by sea planes. Of course, for sea planes other items enter in, such as harbor regulations, the location of floats, and the use of lighting units in such locations that they will not menace the safety of floating craft or cause difficulty to the pilots of these crafts.

Items (h) and (i) are matters of airport management; items (a), (f) and (g) involve high-wattage search lights and flood lights which are not within the scope of this bulletin. It is the purpose of this bulletin, however, to describe and illustrate lighting equipment which is particularly adaptable for the lighting of airways, airports, intermediate flying fields and the interior and exterior of hangars, repair shops and other buildings.



Illuminated Night View of Hangar at Pontiac Municipal Airport, Pontiac, Mich., Showing Results Obtained Using Benjamin Equipment

Hangar Lighting

The hangar may well be considered the hub of the airport. Around it center all the various activities connected with the starting and ending of flights, and the facilities it affords for handling, storing and servicing, go a long way in establishing the prestige and popularity of the air-port. From the standpoint of safety, service and general appearance, the proper lighting of both the exterior and interior of the hangar is of vital importance.

The interior of the hangar is usually divided into two sections—one for the storage of planes—the other for the servicing and repairing.

In the storage areas, speed, ease of handling, and safety to men and materials, require a sufficient quantity of properly directed light to eliminate dark corners, soften harsh shadows and insure clear vision without eye-strain, at any time of the day or night.

In the servicing areas a great deal of the work performed requires the greatest care and skill, for often the lives of many people depend on the care and accuracy with which the repairing and checking operations are performed. As accuracy and skill are in a good measure dependent on good vision, which in turn is dependent on proper lighting, the need for adequate illumination cannot be over emphasized.

The exterior illumination of the hangar ranks equally in importance with the interior illumination. While Government Regulations specify exterior lighting from the standpoint of safety, the advertising and prestige building value of a brilliantly lighted exterior is a real business asset.

The selection of the proper equipment for exterior and interior illumination, with suggested methods of installation, are covered on the following pages.

Lighting of Hangar Storage Areas

To adequately light a hangar storage area it is necessary to provide a system of lighting units which will give a uniform general illumination of at least five foot candles on the horizontal and vertical surfaces. This is the minimum figure to be considered for a location of this kind and any increase over this figure will add proportionately to the value of the installation.

Government Regulations provide that the hangars in fields desiring the highest type of government rating "A", be constructed so that the lower truss chord is at least eighteen feet above the floor. From the standpoint of increased safety, as well as with a view of providing sufficient clearance for the larger sizes of planes, the distance allowed is often as great as twenty-five feet. Bearing these two extremes in mind, the following lighting recommendations are based on a twenty foot distance from the lower truss chord to the floor.

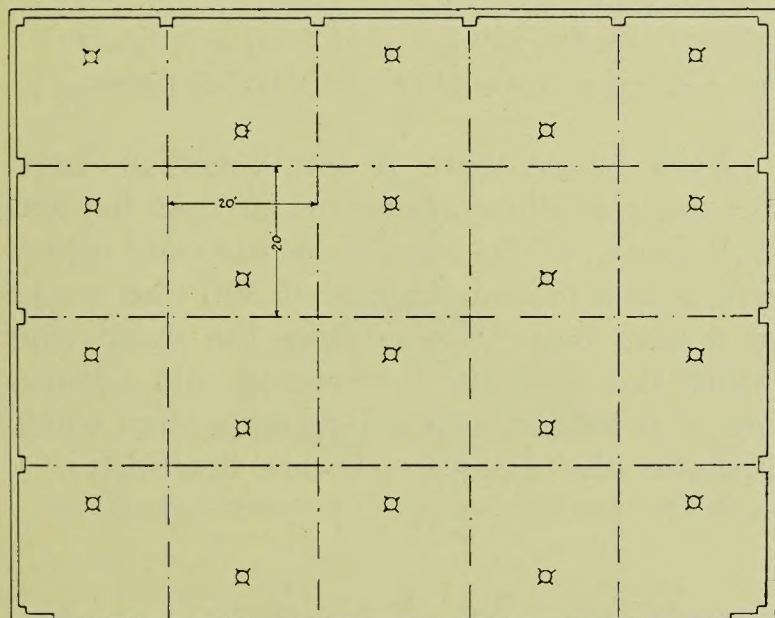


Diagram "A"

Typical Arrangement of Lighting Units in the Bays

According to the rules of good lighting practice, units mounted twenty feet above the floor should be spaced not more than twenty

feet apart. Such a spacing lends itself admirably to structures of the hangar type which are usually built in bays of twenty feet square. However, any uniform spacing of

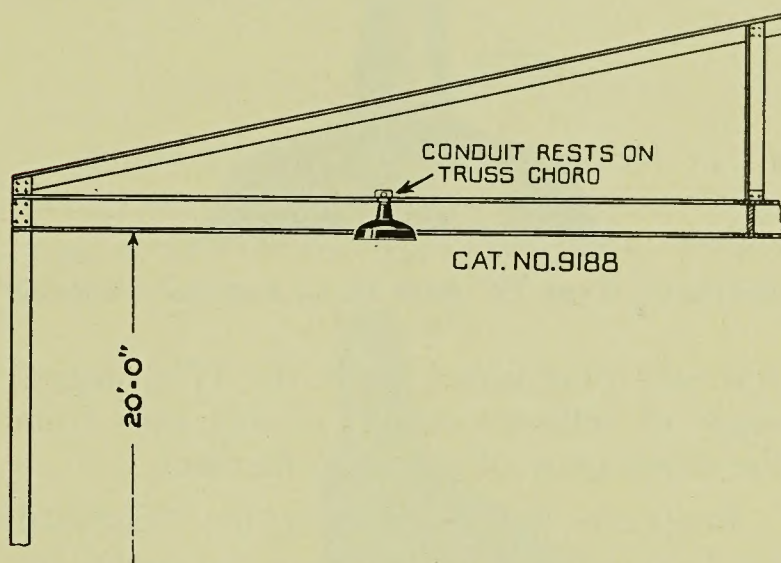


Diagram "B"

Showing Mounting of Reflector in Relation to Ceiling Truss Chord

outlets, which may be necessitated by other structural arrangements, is satisfactory providing that the spacing distance between units does not exceed the mounting height.

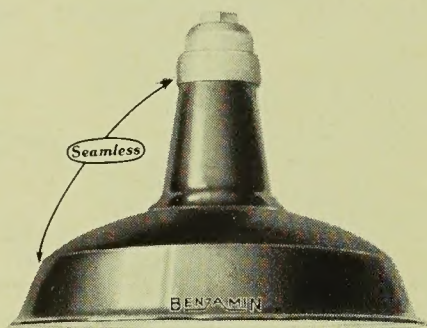
The modern tendency in airplane construction is towards larger planes with a greater wing spread. When this larger type of plane is wheeled into a hangar it may cut off the light from an entire row of units, if the units are spaced symmetrically in the bays. This may be avoided by using a staggered arrangement of units, such as is shown in Diagram "A".

Type of Equipment

Benjamin "Type 79" RLM Dome Reflectors are recommended for the general lighting of the storage areas. Equipped with 300-watt white bowl lamps, and mounted and spaced as recommended above, they will uniformly

light the horizontal and vertical surfaces to an intensity of five and one-half foot candles—sufficient light for this type of location.

Benjamin "Type 79" Reflectors are particularly adapted for general lighting service. Both horizontal and vertical surfaces are ef-



Benjamin "Type 79" RLM Dome Reflector—Catalog No. 7188

fectively illuminated while the $17\frac{1}{2}$ degree angle of reflector cut-off, shields eyes from the direct glare of the lamp filament.

Benjamin Reflectors carry the "Certified by Benjamin" label which is an assurance of satisfactory lighting results combined with the ability to stand up satisfactorily under the service and atmospheric conditions of the locations for which they are recommended.

Benjamin RLM Units are formed from one piece of rust resisting iron and finished inside and outside in smooth lustrous Crysteel porcelain enamel. The enamel is fused into the iron at white hot heat making an unusually efficient and enduring reflecting surface which resists the harmful effects of smoke, fumes and vapors. This finish is unusually tough and is not easily damaged by accidental jars or blows.

The one-piece construction of the heavy gauge metal reflector shape assures mechani-

cal strength and long life, while seams which are often the starting points for corrosion, are entirely eliminated.

Benjamin Reflectors also bear the "RLM Standard" label of the Electrical Testing Laboratories. This label certifies that the reflector meets all the tests and requirements established by a joint committee of Reflector and Lamp Manufacturers for a satisfactory type of general lighting unit.

See Page 25 for a complete description of Catalog Number 7188.

Lighting Repairing Operations

In some hangars it is the practice to make the slight repairs and adjustments, which do not involve the taking down of the engine, in the regular storage areas. When this is done it is necessary to light the storage area to an average intensity of ten foot candles instead of the five foot intensity usually found sufficient. This requires no change in the lighting layout and 500 watt lamps, instead of 300 watt lamps, are used in the same size of reflector previously recommended.

Future Wiring Provisions

Even where there is no immediate need for using anything larger in size than the 300 watt lamp, wiring should be provided which will permit the substitution of 500 watt lamps at a later date. Considering the speed with which this industry is changing and advancing, it is well to have a lighting system which provides the greatest possible flexibility.

Lighting of Hangar Repair Areas

In the repair areas of the shop, a system of general overhead lighting, similar to that recommended for the storage areas, is necessary. However, the lighting problem in this area is somewhat different to the one found

in the storage areas, as the exacting nature of the work performed requires clearer vision and higher levels of illumination. This increase in illumination is obtained by using 500 watt lamps in all of the overhead lighting



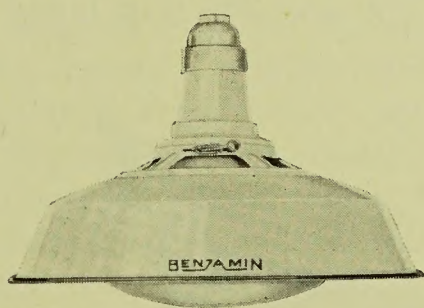
units and by the use of supplementary lighting units to build up higher levels of illumination over certain special areas.

For the general overhead lighting system either the Benjamin "Type 79" Glassteel Diffuser, Catalog Number 7202, or the Benjamin "Type 79" RLM Dome Reflector, Catalog Number 7188, is satisfactory. However, considering the close nature of the work performed in these areas, a Glassteel Diffuser installation offers several distinct advantages over an RLM installation.

The RLM Standard Dome Reflector uniformly lights horizontal and vertical surfaces. It is of seamless construction of Crysteel porcelain enameled steel, and has a $17\frac{1}{2}$ degree angle of cut off which shields the eyes from the direct glare of the lamp filament.

The Glassteel Diffuser retains the high illuminating efficiency of the RLM Dome Reflector, but the intrinsic brilliancy of the lamp is reduced by the opal glass diffusing globe. The light rays from the lamp are broken up and diffused uniformly over the working plane, thereby reducing direct and reflected glare to a minimum and softening harsh shadows.

Apertures in the top of the reflector permit a portion of the light to reach the ceiling and



Benjamin "Type 79" Glassteel Diffuser—Catalog No. 7202

side walls which reduces direct glare by softening the contrast between the lighted units and their surroundings.

As previously mentioned, the lighting of walls and ceilings add a note of cheer to the whole installation, while the white porcelain enameled reflector and opal glass globe com-

bine to make a unit of unusually good appearance.

With both RLM Standard Dome Reflectors and Glassteel Diffusers, mounting heights and spacings should be the same as recommended for the storage areas. That is, with mounting heights of twenty feet or under, the spacing between units should not exceed the height of the unit above the floor.

Servicing Large Planes

Where large planes are serviced in the repair shops, the horizontal area of the wings tend to cut off the light from those vertical



Benjamin Elliptical Angle Reflector

Catalog No. 5537 Side View

portions which are most frequently in need of attention. For that reason the general overhead lighting system should be supplemented by a complete system of Benjamin Elliptical Angle Reflectors, Catalog Number 5537, mounted along the side walls of the hangars.

In order to distribute the light over the vertical surfaces beneath the wing area, the mounting height of the Elliptical Angle Reflectors must not exceed the height of the plane above the floor. Taking these factors into consideration, the most practical mounting height will be approximately fifteen feet above the floor. The distance between units should never exceed twenty feet—a spacing which accommodates itself very well to the usual structural section. See Diagram "C" for spacing arrangement.

Catalog Number 5537, Benjamin Elliptical Angle Reflector, accommodates either 300 or

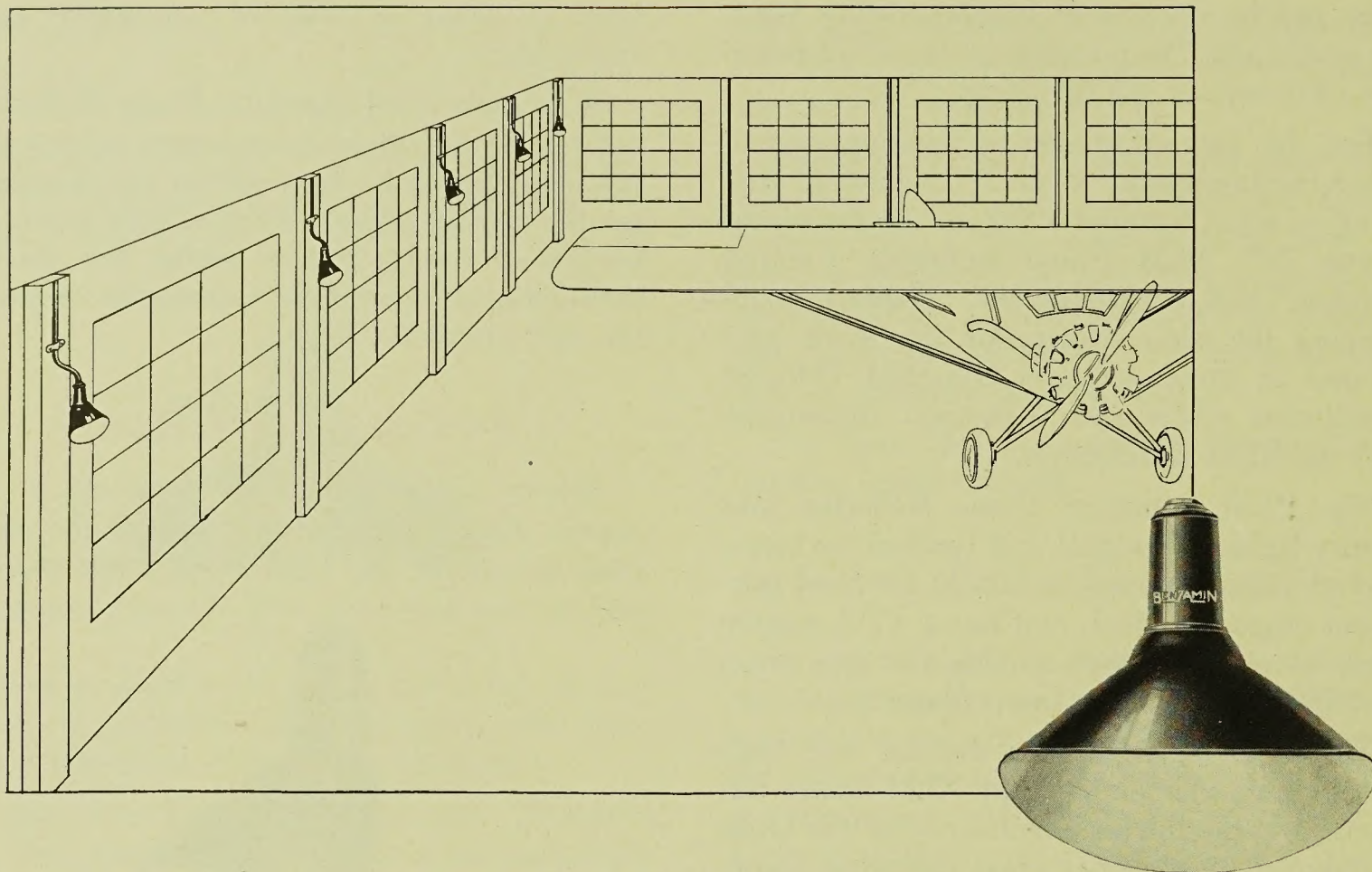


Diagram "C"

How Benjamin Elliptical Angle Reflectors are Used to Supplement Overhead Lighting Units where the Wing Spread Cuts Off the Light from Above

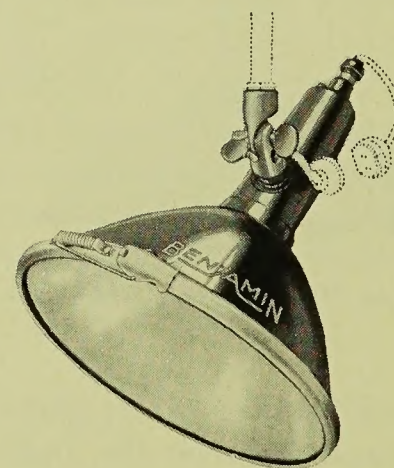
500 watt lamps. Provisions should be made in wiring, so that if future conditions warrant, the larger size of lamp can be used. Using 300 watt lamps in the side lighting reflectors, the combined overhead lighting and side lighting system will furnish fifteen to twenty foot candles, which is the required level of illumination for the class of work performed.

Lighting Special Operations

Unusually exacting operations will require clearer vision than is possible with the light supplied from the overhead and side lighting systems only. With this problem in mind, Benjamin has designed a special unit known as "The Intensifier," which concentrates an intense beam of light over a small area.

The Benjamin Intensifier is suitable for lighting work benches, special machinery or any small area where a high intensity of light is desired. The Intensifier is adjustable to

any angle and can be mounted on the side wall, column, or built up pipe frame. It is available in two sizes: Catalog Number 5603, for 60 and 100 watt lamps; Catalog Number 5604, for 150 and 200 watt lamps.



*Benjamin
Intensifier
Catalog
No.
5604*

As an example, Catalog Number 5603 with a 100 watt lamp, mounted five feet above a surface will illuminate an area of ten inches in diameter to an average intensity of one hundred foot candles. Using Catalog Number

5604 with a 200 watt lamp, the beam will be widened to fifteen inches in diameter and the lighting intensity raised to two hundred foot candles.

The Benjamin Intensifier may be installed off to the side and from this position will effectively illuminate vertical or horizontal surfaces. Side mounting is necessary where the construction of the building interferes with overhead suspension or where overhanging machinery would block the light from units mounted directly over the working surfaces.

The use of the Intensifier does not mean that the regular overhead and sidelighting systems can be dispensed with in those areas where special operations are performed.

The general lighting system of the shop must be extended over these special areas, as well, and the Intensifiers installed must be regarded simply as supplementary to the general lighting system. It is important that a high general average of illumination be provided even where a large number of Intensifiers are used, to relieve the contrast between the brightly illuminated areas and the adjacent surroundings.

Lighting of Doping Room

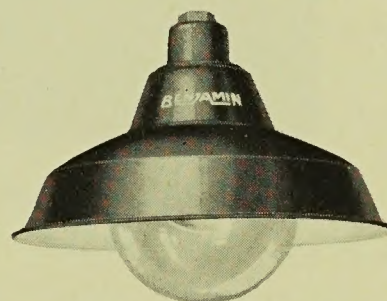
Safety suggests that the doping room, in which wing repairs are undertaken, be completely isolated from other parts of the hangar. Because of the volatile nature of the dope used, the doping room is regarded as a hazardous location and all lighting equipment in this room should be of approved gas and vapor proof construction and installed in compliance with Article 32 of the National Electrical Code. The Benjamin Line of Gas and Vapor Proof Equipment, which meets all safety and lighting requirements, is recommended for this purpose.

The doping room should be lighted by a system of general overhead lighting units, producing a lighting intensity of not less than 8 foot candles.

The Benjamin Gas and Vapor Proof Dome Reflector is a lighting unit possessing the necessary lighting characteristics for good general illumination.

Safety is assured by the vapor proof construction of the unit. The reflector is of Crysteel porcelain enameled steel and is threaded on the inside of the neck to accommodate the heavy glass screw globe which encloses the lamp. An asbestos gasket seals joint between globe and reflector neck and keeps combustible gases from coming in contact with the hot lamp surfaces.

Where fixtures are in danger of breakage from jars or blows, the Benjamin line of Globe Guards offer an increased margin of

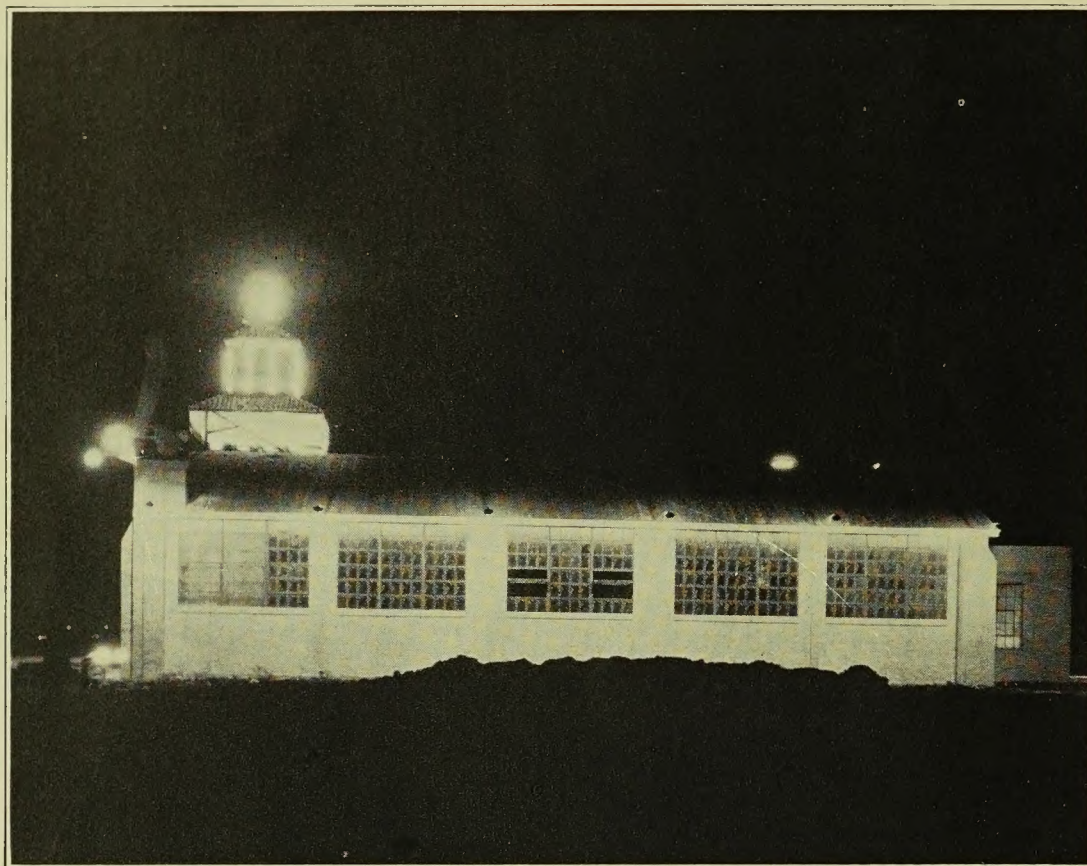


*Benjamin Gas and Vapor Proof Dome Reflector—
Catalog No. 1586*

safety. They are listed on page 29 while Benjamin Gas and Vapor Proof Dome Reflectors are shown on page 26.

If the ceiling is low—in the neighborhood of twelve to fifteen feet—the 200 watt size of Benjamin Gas and Vapor Proof Dome Reflector (Catalog Number 1586) is the correct unit. It is mounted close to the ceiling and the spacing distance in no instance should exceed the mounting height of the units above the floor.

Where ceilings are in the neighborhood of fifteen to twenty feet in height, the spacing distances will be proportionate and the larger size of unit, Catalog Number 1588, is needed. This unit accommodates either 300 or 500 watt lamps—the size lamp selected depending on the mounting height of the unit above the floor. Where the ceiling height does not exceed eighteen feet the 300 watt lamp will be satisfactory, but any height over this figure will necessitate the use of 500 watt lamps.



*The Exterior Illumination of this Hangar is Supplied by an Installation of—
Benjamin
300 Watt
Elliptical Angle
Reflectors with
Standard Lamps*

Night View of Hangar Exterior at Los Angeles Municipal Airport

Lighting of Hangar Exteriors

When the sides and roof of the buildings around the airport are brightly illuminated, the pilot is given a better perspective by which to judge his height in making a landing. This safety measure is considered of such importance that the Government Regulations for "A" rated flying fields specify that the exterior of hangars and adjacent buildings be adequately illuminated.

An exception is made where a considerable portion of the sides of the hangars are of glass, and in this case it is permissible to dispense with exterior side lighting, providing the interior of the hangar is kept sufficiently illuminated so that the window area will stand out against the surrounding darkness. Such a method necessitates keeping the interior hangar lights on during all the dark hours, but as the light serves a double purpose, this is often a desirable feature.

The advertising value of a well lighted field must not be overlooked, for such a field attracts the general public, makes them flying conscious, and creates a feeling of prestige and civic pride in the airport.

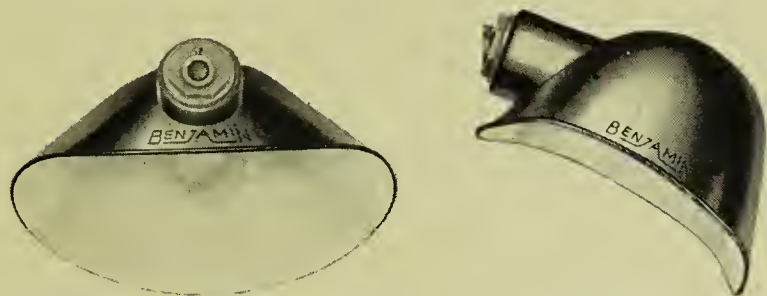
The lighted sides of the buildings can also be utilized for signs calling attention to special features or attractions offered by the airport.

Side Wall Lighting

The exterior illumination of the sides of hangars and adjacent buildings is taken care of by an installation of either Benjamin Sign Reflectors, Catalog Number 5571, or Benjamin Elliptical Angle Reflectors, Catalog Number 5537—the equipment selected depending on the height of the buildings and the brightness of adjacent objects.



Both of these units are designed especially for the lighting of vertical surfaces. They are compact, inconspicuous, and when properly installed, will uniformly light the side walls without scallops or shadows. A wide lateral distribution builds up illumination between units and makes for uniform illumination. A complete description of this equipment is given on page 26.



Front View—Benjamin Sign Reflector—Catalog No. 5571

Side View—Catalog No. 5571

Where the height of the hangar does not exceed twenty feet, and the adjacent surroundings are not particularly well illuminated, the Benjamin Sign Reflector Catalog Number 5571, with 200 watt lamps, will be satisfactory. The units are mounted out from the side wall a distance equal to half the height of the wall. They are equally spaced along the side of the hangar with the distance between units in no case exceeding one and one-half times the distance of the unit from the side wall.

Where the wall exceeds twenty feet in height, or it is desirable to make an ordinary height hangar stand out against fairly bright surroundings, the Elliptical Angle Reflector, Catalog Number 5537, for 300 and 500 watt lamps, or Catalog Number 5538, for 750 and 1000 watt lamps, will be found suitable. These units are to be mounted in the same manner as described above. For example, if the side is twenty feet high, the reflectors will be placed ten feet out from the wall with the distance between units not exceeding fifteen feet.

See Diagram "D" for spacing and mounting information.

Roof Lighting

The roof of the ordinary hangar may be evenly and adequately illuminated by an installation of Benjamin Catalog Number 5644 seamless RLM Dome Reflectors, using either 300 or 500 watt lamps.

Units are mounted ten feet directly above the roof and spaced twenty feet apart. 300 watt lamps will be satisfactory except in those instances where the roof area is used as an air-way marker. It is well however, in the light of future changes, to provide wiring for 500 watt lamps. As roofs are usually made of dark material, higher wattage is required than for locations of lighter color.

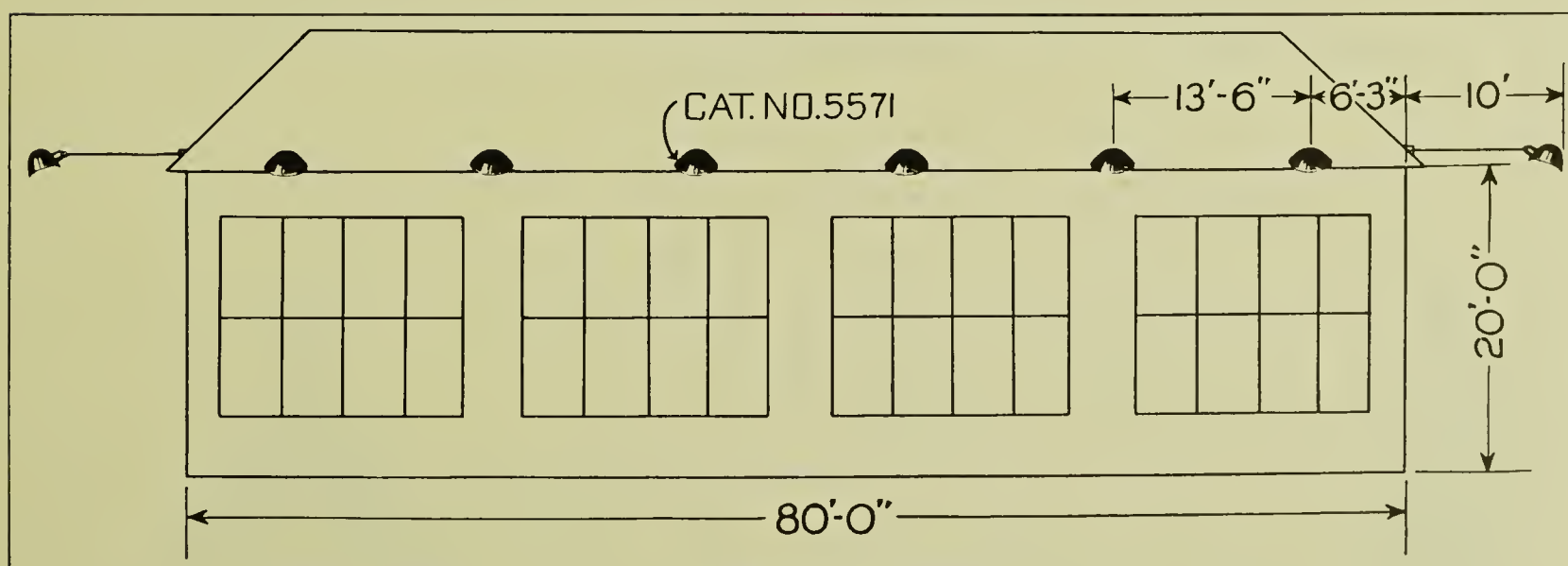


Diagram "D"

Showing Mounting of Benjamin Sign Reflectors to Light a Typical Hangar Side Wall

In some instances it is desirable to supplement the light from the overhead units with an installation of side mounting reflectors, or in still other instances, to dispense entirely with overhead lighting units. In such cases, Catalog Number 5537 Benjamin Elliptical Angle Reflector, with 300 or 500 watt lamps, is recommended.

Where the side lighting system is used to supplement the overhead units, 300 watt lamps are used in the side mounting reflectors. Where overhead units are dispensed with entirely, 500 watt lamps are necessary to obtain the required illumination.

Lighting Taxi Strip or Apron

To facilitate loading and unloading of the planes, it is desirable to illuminate the strip

mounted on the cornice or on pipe standards and turned out towards the field. For satis-

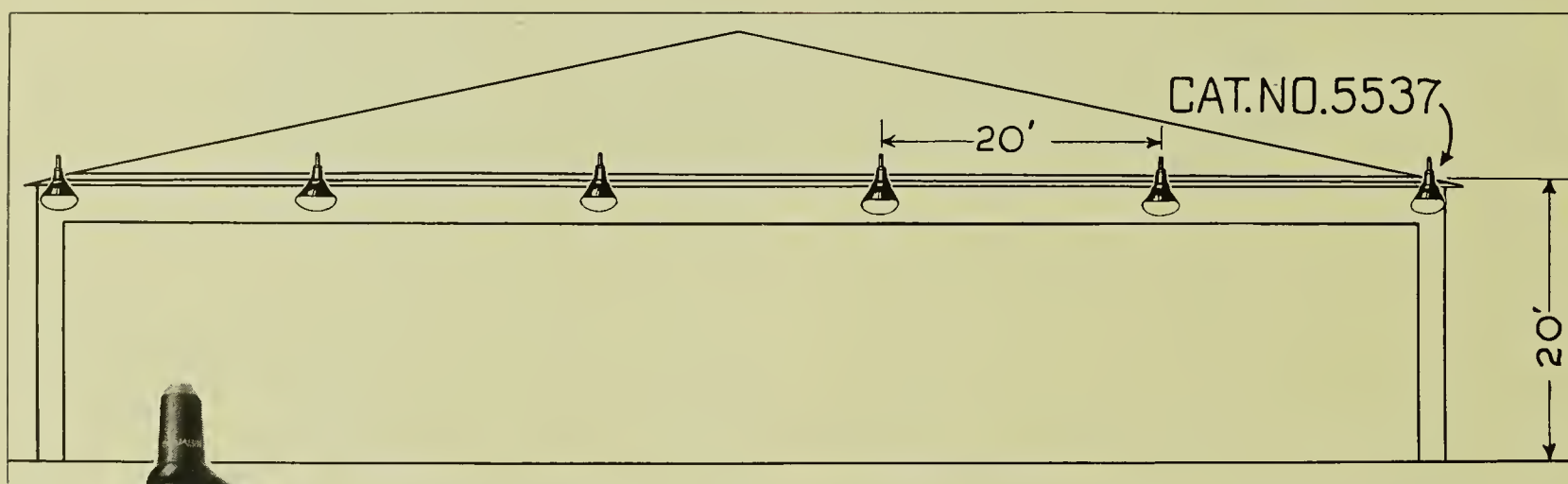


Diagram "E"

How Benjamin Elliptical Angle Reflectors can be Mounted and Spaced for Lighting the Taxi Strip or Apron

in front of the hangar. This is accomplished by using Benjamin Elliptical Angle Reflectors Catalog Number 5537, with 300 watt lamps;

factory results units must be mounted at least 20 feet above the ground and not spaced more than 20 feet apart. See Diagram E for method of mounting.

Lighting of Wind Cone Indicators

The Wind Cone Indicator now in general use is a fabric cone, approximately fifteen feet in length, three feet in diameter at the upright and one foot in diameter at the tip. The cone is so fastened that it is free to revolve about the upright.

From the pilot's point of view the cone can be best seen when lighted from directly overhead against a dark background and the il-

lumination provided must be such that the cone can be easily located and identified regardless of its position or the direction of the wind.

The Wind Cone Indicator can be adequately illuminated using a combination of one Benjamin Watertight Fixture, Catalog Number 6800, with Ruby Glass Globe, and four Benjamin Bowl Reflector-Sockets. Catalog Number 6800 forms the required obstruction

light on the top of the cone and is mounted directly on the upright which supports the cone. The cast brass outlet box of this unit is tapped on each of its four sides to accommodate a $\frac{3}{4}$ inch pipe and into these openings are turned the four goose necks used for supporting the bowl reflectors that provide the illumination for the cone. The reflectors are mounted a sufficient distance above the cone so that it will be illuminated even when extended its full length of fifteen feet.

Government regulations specify the use of at least a 50 watt lamp in the obstruction light and 100 watt lamps in the bowl reflectors. However, it is recommended for best results that either a 60 or 100 watt lamp be used in Catalog Number 6800 and the 150 watt size of Benjamin Bowl Reflector, Catalog Number

6189, be used in preference to Catalog Number 6161, which is the 100 watt size.

The Benjamin Bowl Reflector concentrates the light over the surfaces directly beneath the unit. It is of one-piece seamless weather-proof construction—Crysteel porcelain enamel fused into rust resisting iron—and will maintain its efficiency under adverse weather conditions. A complete description of the line of Benjamin Bowl Reflector-Sockets is given on page 27.

Benjamin Catalog No. 6800 is a heavy duty, water-tight fixture of unusual strength. The outlet box is of cast brass while the lamp is sealed by a heavy glass screw globe which in turn is protected by a heavy brass wire guard. All joints are sealed. See page 28 for a complete description.

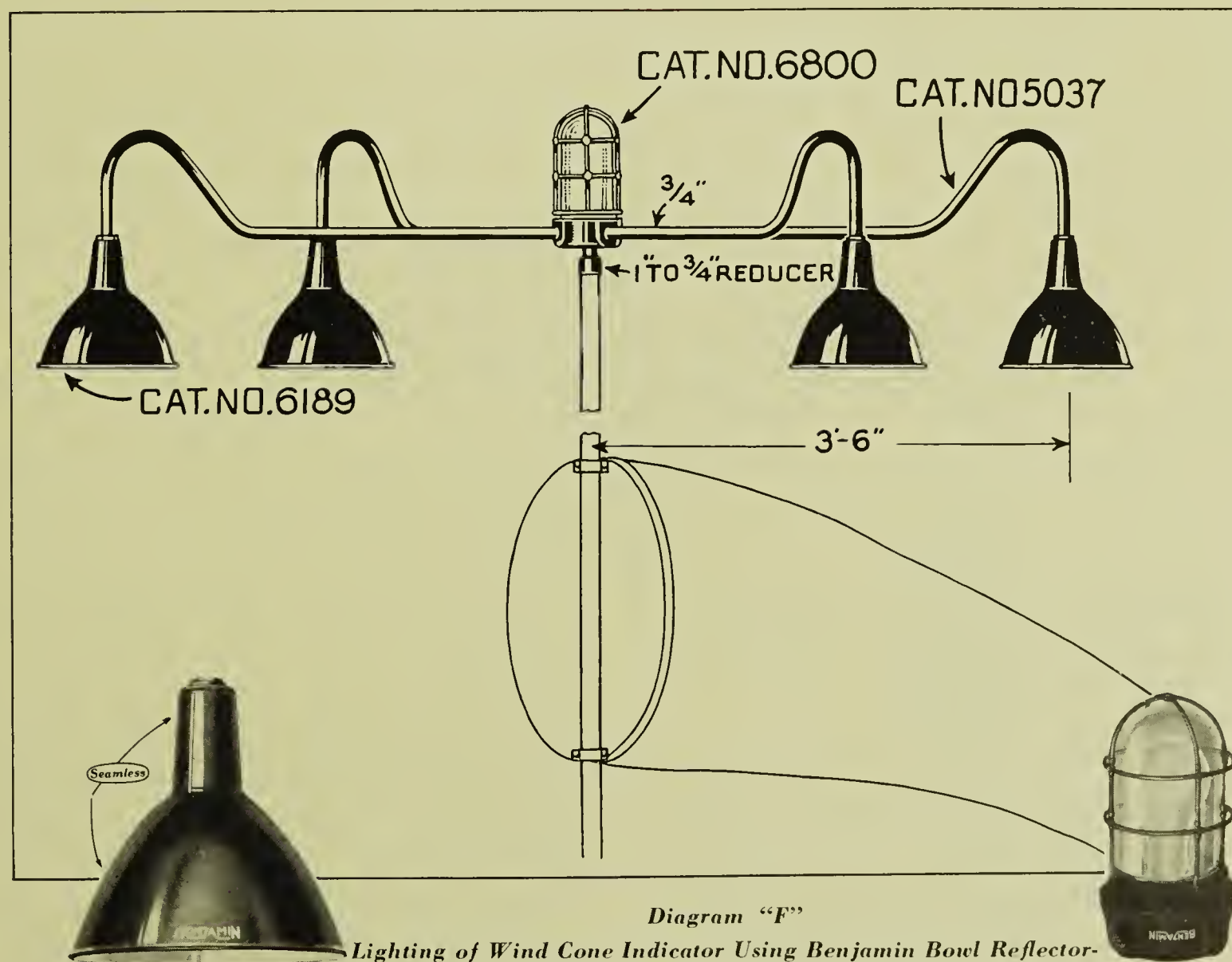


Diagram "F"

Lighting of Wind Cone Indicator Using Benjamin Bowl Reflector-Sockets and Catalog No. 6800 Water Tight Fixture

Boundary Lighting

A field in which the planes may land from any direction is known as an all-way field and Government Regulations require that such a field be outlined by boundary lights.

fully for this boundary marking service. The unit consists of a heavy brass fitting, socket and a glass enclosing globe which is protected by a heavy brass wire guard. A complete

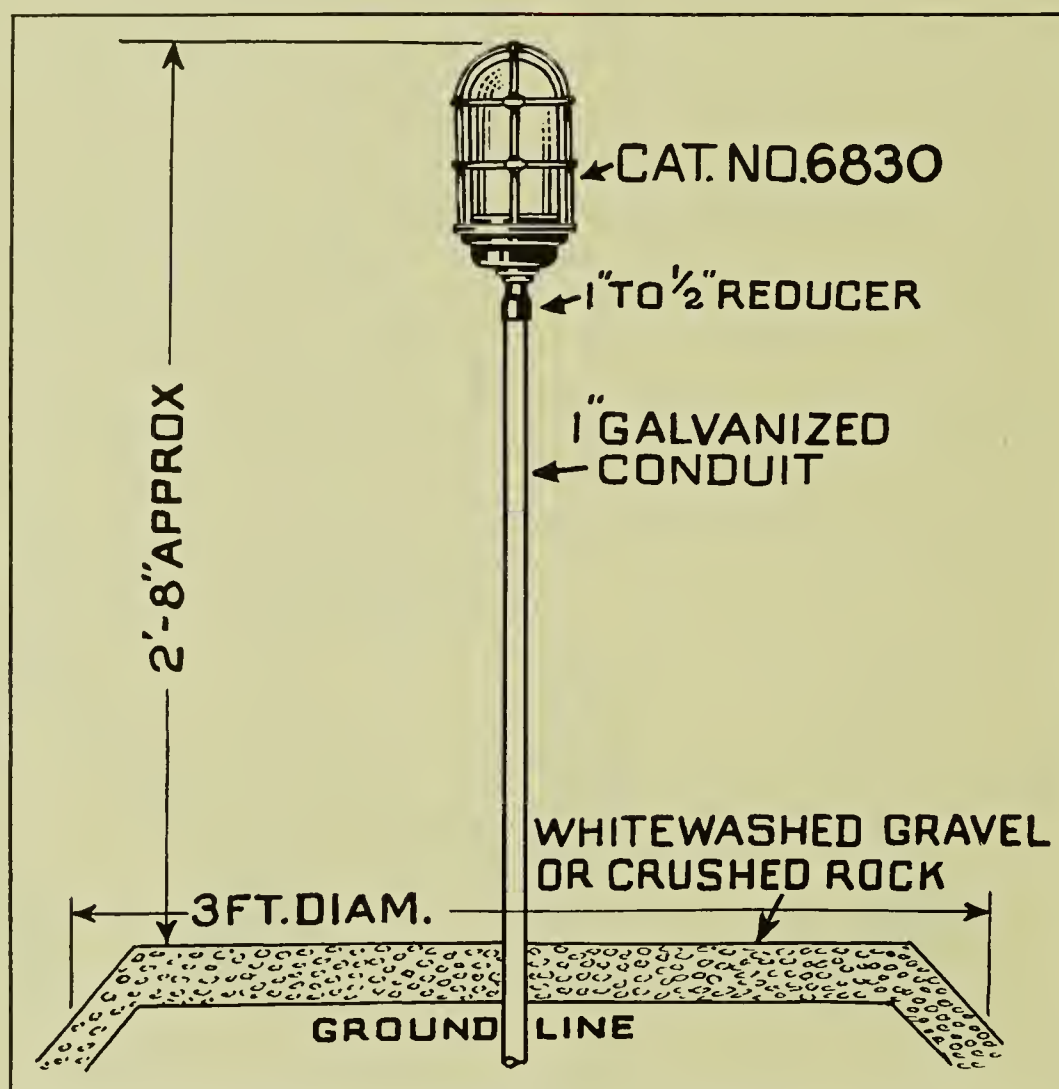


Diagram "G"

*Boundary Lighting Arrangement Using Benjamin Water Tight Fixture
—Catalog No. 6830*

These lights are usually white with the exception that the best direction of approach is indicated by a green marker.

On fields where there are a number of runway strips which must be used instead of the entire field area, the strips must be bordered by white boundary lights with a green light at the end of each strip.

The Benjamin Heavy Duty Water Tight Fixture, Catalog Number 6830, with either a clear or green globe, has been used success-

description of Catalog Number 6830 is given on page 28.

The units are mounted on a two or three foot stem of galvanized pipe or conduit. To increase the daylight visibility of the standard, a three-foot circular area around the pipe stem is covered with whitewashed gravel or crushed stone.

While regulations permit a maximum distance of three hundred feet between boundary lights, the modern trend is towards much

closer spacing. Where boundary lights are spaced far apart, it is difficult for a pilot to identify the corners of the flying field. However, if lights are spaced approximately seventy-five feet apart, a pilot flying over any corner of the field will see enough of the lights to accurately establish his position with relation to the boundaries of the field.

Where air ports are located alongside streets or highways parallel to the boundaries of the flying field, the proximity and closer spacing of the street lights may cause difficulty in identifying the smaller more widely spaced boundary lights. This condition can be remedied by a closer spacing of the boundary lights and the use of amber or colored globes in preference to clear globes. It is well, therefore, to make wiring provisions for the installation of boundary lights on seventy-five to one hundred twenty-five foot spacings, even though present conditions do not warrant such a close spacing.

The Government Regulations provide that at least a 25 watt lamp be used in fixtures with clear globes, when used on a multiple circuit, and that at least 50 watt lamps be used in the green globes.

Boundary lights are usually served by a Parkway Cable laid in a shallow trench, the electrical conductors going to a watertight outlet box into which is threaded the piece of one inch pipe forming the support of the unit.

The choice of multiple or series method of electrical distribution will depend primarily on the source of electrical service available, the location of the distribution centers and the switching arrangements.

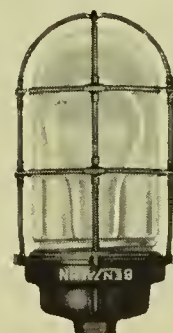
When the question of lighting the flying field is considered as a whole, with the necessary provision made for electrical service to floodlighting units and similar equipment, the multiple system of distribution will probably be found the most practical and economical.

Lighting of Obstructions

A sufficient number of obstruction lights should be installed in the neighborhood of an airport to assure flying safety to a pilot unfamiliar with the field. In the neighborhood of the airport all buildings, chimneys, towers, water tanks, smoke stacks and the like should be indicated by red obstruction lights. The pole lines along the flying field, the top of the beacon tower and all other buildings in the airport should be similarly indicated. Where the obstructions are not over thirty feet high a single unit mounted on top of the obstacle is usually sufficient. Where the height of ob-

structions exceed this figure, units should be provided for every thirty feet of height.

*Benjamin
Heavy Duty
Water Tight
Fixture—*

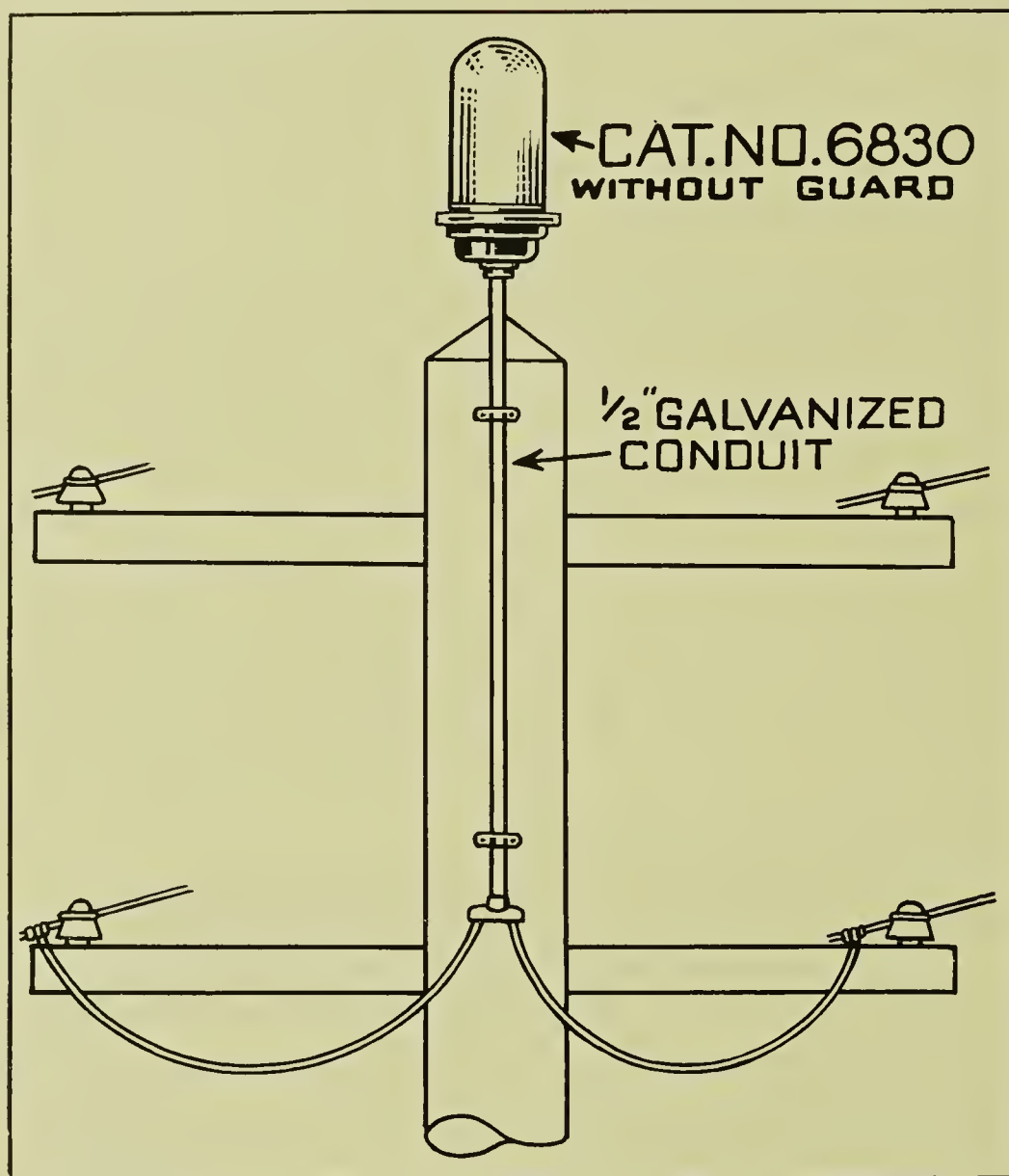


*Catalog No.
6830
with Red Globe*

Any unusually dangerous hazard should be marked by two lights to eliminate danger of accident if one of the lights fail.

Benjamin Heavy Duty Water Tight Fixture with a red globe, Catalog Number 6830, is recommended for this service. This unit will take lamps ranging in size from 50 to 100 watts and is fully described on page 28.

50 watt lamps are the minimum size specified for this service but for best results the 60 or 100 watt sizes of lamps are recommended.



*Diagram "H"
Method of
Lighting
Obstructions
Using Benjamin
Heavy Duty
Water Tight
Fixture—
Catalog No.
6830*

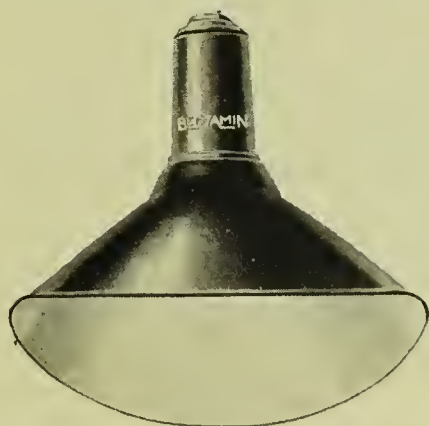
Lighting of Intermediate Fields

While the intermediate fields need have no attendants or hangar facilities, they must be provided with boundary lights, wind cone illumination, lights for the airway direction markers, and obstruction lights. Radio towers

or the towers for high-tension transmission lines and any other structures in proximity to the intermediate field should be protected by obstruction lights as indicated for the main landing fields.

Lighting of the Airways

The airway consists of an imaginary road five miles in width extending in a straight line between two important air fields. From the standpoint of safety to night flyers every high or dangerous obstruction along these



*Benjamin Elliptical Angle Reflector—
Catalog No. 5537—Front View*

airways must be plainly marked in a manner which is visible under all weather conditions. Radio towers, transmission towers, water tanks, high buildings and high chimneys must all be plainly indicated by a red obstruction light—or as in the case of chimneys where smoke clouds frequently obscure the ordinary obstruction light—must also be flood lighted.

Every high or dangerous obstruction, particularly those adjacent to the airport or to high mountain passes, should be lighted by a series of units to assure visibility from every possible direction.

Where the obstruction does not exceed thirty feet in height one series of units, mounted close to the top of the obstruction, will serve as an adequate warning light. On obstructions exceeding thirty feet in height, a series of units must be provided for every thirty feet of height; the last series of units mounted close to or on top of the obstruction. Each series must consist of two or more units so that if one light fails the other is still visible.

The Benjamin Heavy Duty Water Tight Fixture Catalog Number 6830, with ruby glass

globe, will serve as a suitable obstruction light. 50 watt lamps are the minimum size permissible in this service and as an additional precaution 60 or 100 watt lamps, either of which can be used in Catalog Number 6830, are desirable. Catalog Number 6830 is described on page 28.

Benjamin Elliptical Angle Reflector Catalog Number 5537, or Benjamin Projectolite Catalog Number 5613, will be found suitable for floodlighting chimneys, water towers, and similar obstructions.

The Benjamin Elliptical Angle Reflector, which is designed especially for lighting vertical surfaces from the side, is a thoroughly weatherproof unit of rust resisting iron—finished inside and outside in Benjamin Crysteel porcelain enamel. For complete information see page 26.

The Benjamin Projectolite is a heavy duty water tight unit designed especially for lighting straight and rounded surfaces from a grazing angle. Adjustable to any angle—it has a special ribbed glass lens which directs the greater portion of the light on the surfaces farthest from the unit with a correspondingly



*Benjamin
Projectolite
Unit*

*Catalog
No.
5613*

lesser amount on the surfaces adjacent to the light source. The result is even illumination over the entire surface. The Benjamin Projectolite is designed for use with 300 watt standard clear lamps and is fully described on page 27.

Lighting of Rahway Aviation Roof Sign

On National Pneumatic Bldg., Rahway, New Jersey

Dimensions—"Rahway"

The chrome-yellow cut-out letters are seen against a background of dark gray crushed stone on the tar roof. The surface of the sign is raised 12 inches above the surface of the roof.

64 feet in overall length. Individual letters 15 feet high by 8 feet 6 inches wide, width of stroke 15 inches. The arrow indicating north is 22 feet long; the letter N is 6 feet high by 6 feet wide. The other arrow is 20 feet long; the figures in "12" are 7 feet 6 inches high and show distance to Newark Airport.

Lighting Equipment

12 one piece RLM Dome Reflectors (Benjamin No. 5644), with 300 watt clear MAZDA lamps. Mounted 9 feet above sign, at locations indicated on diagram. Provision has been made for substituting 500 watt lamps should later conditions indicate desirability. Reflectors mounted pendant, but arranged to allow inclination 10° for re-adjustment of light distribution. Supporting brackets for units over "Rahway" are T shaped and each carry two units. Those over the direction arrows are inverted L shape and carry one unit each. Brackets made of 1 inch pipe. The illustration averages 1.25 watts per square foot, the resultant foot candles at various points are noted on the diagram by the figures within the circles.

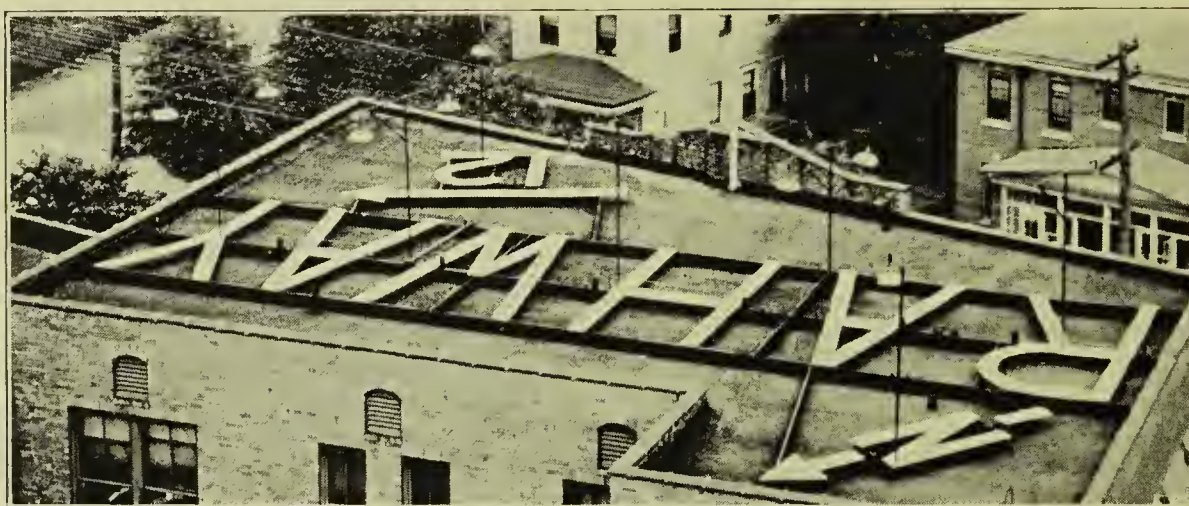
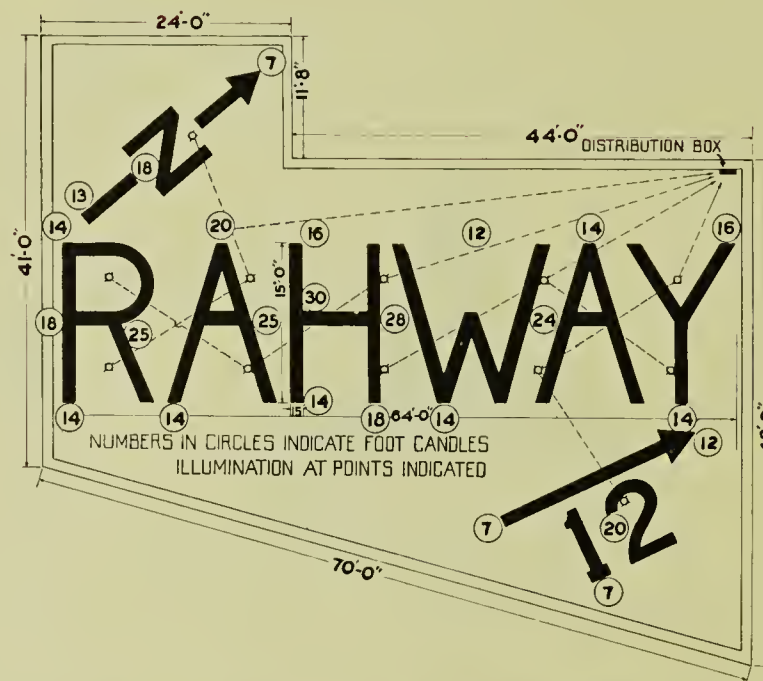
Wiring

Service to distribution box, 220-volt three-wire No. 8 conductors controlled by hand operated 60 ampere safety switch located inside the building.

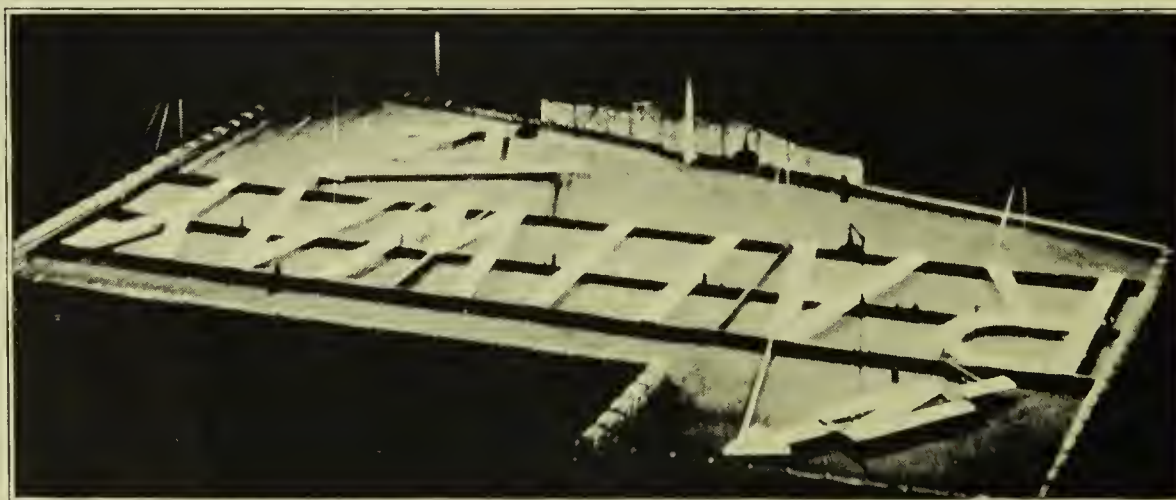
Branch Circuits

As indicated in diagram, four two-wire 110-volt circuits of No. 12 wire carry three lamps each, so arranged that failure of one branch circuit will not extinguish adjacent lamps.

The wire capacity is adequate to supply 500-watt lamps without excessive voltage drop.



Day View of Sign Showing Mounting of Reflectors



Un-retouched Night View Showing Illumination Obtained Over Sign Surfaces



Diagram "I"

Typical Layout Showing How Benjamin Elliptical Angle Reflectors are Used in Lighting Roof Signs from the Side

Lighting of Airway Roof Signs

Many municipalities are installing airway roof signs for the guidance of pilots. These signs are of two types: the first, consisting merely of a sign painted on the roof; the second, enameled steel or wood block signs mounted slightly above the roof level. Due to the accumulation of dirt and snow the raised type of sign will usually be found more satisfactory than signs painted directly on the roof.

Letters may range in size from ten to thirty feet. Twelve feet is suggested as a minimum height while less than six feet should never be considered. The most effective sign will be made by painting Gothic style letters, in chrome yellow, against a dead black background. The chrome yellow specified is color number four on the United States Army Specification Chart.


When possible, the sign should indicate the name of the city or town, the meridian marker (True North Arrow Indicator), and an arrow indicating the direction of the nearest air

port. Adjacent to this arrow the distance to and the rating of the nearest airport should also be shown.

Three methods have been successfully used in lighting signs of this type. The first method is similar to the procedure followed in regular sign lighting and utilizes regular sign lighting equipment. The second method is to treat the sign area as one would any area of identical size. This means the installation of general overhead lighting units—mounted directly over the sign areas and spaced according to the rules of good lighting practice. The third method is to outline the letters of the sign by means of small wattage lamps which are spaced to correspond with the contour of the letters.

Lighting from the Side

In this method the sign may be regarded as a poster panel lying in the horizontal plane. Where the overall height of the sign does not



exceed eighteen feet and in dark locations the 200 watt size of Benjamin Sign Reflector Catalog Number 5571, will be found suitable. Where adjacent surroundings are well lighted, or it is desired to make the sign readable from a greater distance, the use of the Benjamin Elliptical Angle Reflector Number 5537, with 300 or 500 watt lamps, is recommended. This reflector possesses lighting characteristics similar to the Benjamin Sign Reflector and is fully described on page 26.

Reflectors should be mounted above the sign as shown in Diagram "I," with the inside top edge of the reflector shape on a line slightly above the top of the letters. Reflectors should be mounted out from the sign a distance equal to one-half the height of the letters to be illuminated—for example, the units should be six feet from the face of a twelve foot letter. The distance between reflectors must in no case exceed one and one-half times the mounting height of the reflectors above the sign. That is, in the example just given, the distance between units should not exceed nine feet.

A closer spacing of units is often desirable from the standpoint of safety. With units closely spaced the visibility of the sign will not be seriously affected by the occasional lamp failure of one or more units.

Lighting From Above

In this method the sign area is lighted in the same manner as any area of identical size. Benjamin RLM Seamless Dome Reflector-Sockets, Catalog Number 5644, equipped with 300 watt clear lamps, are mounted on pipe standards a distance of nine feet directly above the surface of the sign. The spacing between units should in no case exceed twelve feet and for better sign visibility a ten foot spacing distance is recommended. A sufficient number of units should be used to assure uniform illumination over the entire sign surface.

Changing conditions make it desirable to provide a flexible lighting system. While 300 watt lamps may supply adequate illumination at present, the lighting up of adjacent areas at some time in the future may necessitate a more brilliantly lighted sign to command attention. As the present reflector, Number 5644, will also accommodate 500 watt lamps, the solution is simple. Just make wiring provisions in the present system for 500 watt lamps and future requirements will be automatically provided for.

A very noteworthy lighting installation, using the overhead mounting of units, was made recently on an aviation sign installed on the roof of the National Pneumatic Building, New Brunswick Avenue, Rahway, N. J. This sign, which is on the main route between New York and Philadelphia, materially aids both day and night flyers. The night illumination of the sign is supplied by twelve, Catalog Number 5644, Benjamin RLM Dome Reflector-Sockets, using 300 watt Mazda clear lamps. Complete data on the installation is given on page 18.

Outlining Letters

It is sometimes desirable to make up airway markers from lamps grouped in the form of letters, arrows and similar designs. As these lamps are exposed to all sorts of inclement weather it is necessary to provide protection such as is offered by the Benjamin Heavy Duty Water Tight Fixture, with clear glass globe, Catalog Number 6830. Catalog Number 6830 is illustrated under Boundary Lighting on page 14, and is listed in detail on page 28.

Lamps are to be placed at one foot intervals along the stroke of the letter. In dark locations 15 watt lamps will be sufficient, but to assure the readability of signs near brightly lighted towns or cities, the 25 or 40 watt size lamps will be required.

Lighting of Public Areas

In the modern up-to-date air port provisions must be made for the adequate lighting of the parking areas, waiting rooms, observation balconies and similar locations.

Parking Areas

Parking areas are most effectively illuminated from the side. The Benjamin Elliptical Angle Reflector, Number 5538, listed on page 26, is recommended. Generally speaking these units should be installed at least thirty feet

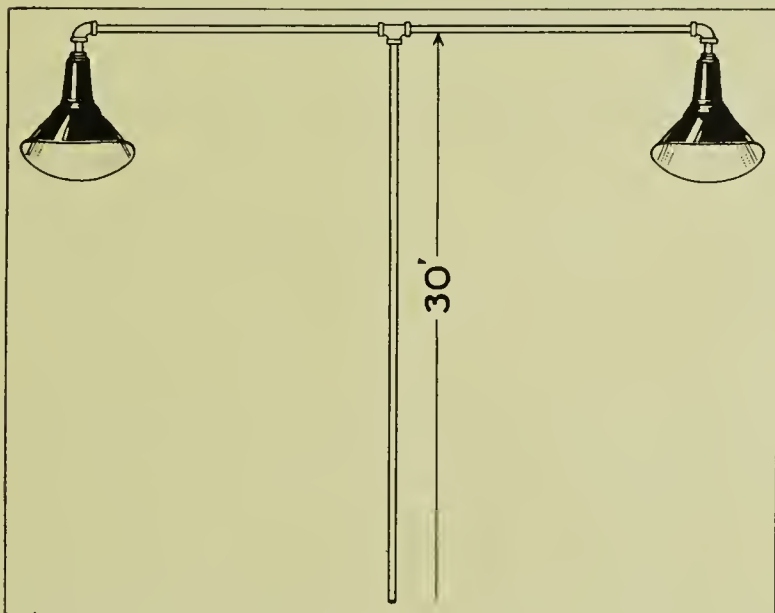


Diagram "J"

Method Used in Lighting Parking Areas

above the ground with a distance between units of thirty or forty feet. The units may be mounted on the cornice of the buildings, directed so as to illuminate the desired area, or can be installed on standards or poles provided for the purpose. 1000 watt size lamps should be provided for the reflectors. See Diagram "J" for details of installation.

Building Entrances

For lighting small entrance areas, the Benjamin RLM Dome Reflector, Catalog Num-

ber 5641, described on page 26, is recommended. This unit, using a 100 watt inside frosted lamp, should be mounted as close to the ceiling as construction will permit. This same combination is also ideal for lighting stairways, hallways, visitors' promenades, balconies, and similar locations. It can also be tastefully worked into the lighting of tea gardens and restaurants when placed over openings in overhead drapes and awnings.

Waiting Rooms

In waiting rooms, rest rooms, ticket offices and the like, the Benjamin "Type 79" Glassteel Diffuser, Catalog Number 9201, will be found unusually satisfactory. This unit lights the upper walls and ceilings of the room, as well as the areas underneath the unit, thereby imparting a bright and cheery appearance to the entire room area. In addition, the combination of a white porcelain reflector and an opal glass diffusing globe make an unusually attractive appearing fixture which harmonizes with any style of surroundings.



Benjamin "Type 79" Glassteel Diffuser—Catalog No. 9201

Glassteel units should be equipped with 200 watt standard lamps and attached directly to ceiling outlet boxes. The spacing distance between the units should in no case exceed the mounting height of the reflector above the floor.



*Unit of Assembly Department in Boeing Airplane Company Plant at Seattle, Washington.
Showing Illumination Supplied by Benjamin Equipment*

Lighting of Airplane Factories

Machine Shops

The lighting of the machine shops present the same problem encountered in any similar industrial location. In this type of location the close and accurate nature of the work requires a lighting system that assures clear vision in all parts of the shop.

The Benjamin "Type 79" Glassteel Diffuser will be found particularly suitable for this type of lighting. It gives a soft evenly diffused light over upright and flat surfaces, eliminates direct and reflected glare from shiny objects and gives to the whole room a bright, cheerful appearance.

The "Type 79" Glassteel Diffuser also offers many unusual construction advantages. The lamp reflector and globe come down as a complete unit with one simple turn of the reflector to the left in the hood. This permits a scheduled maintenance program to be carried out at a very nominal cost.

Wiring is unusually easy as all wiring connections are made to easily accessible binding screw terminals in hood terminal base.

All "Type 79" hoods are of the same size, and interchangeable. This makes it possible to install a larger size reflector at some later date, if conditions seem to warrant such a change. Wiring need never be disturbed, if wiring provisions are made in the original layout for the maximum size units which are likely to be used in the location in question.

Generally speaking, Glassteel units should not be mounted closer than 24 inches to the ceiling. The distance between units should never exceed the mounting height above the floor. This is always a safe rule to follow, providing the ceiling heights are twenty feet or lower. In general, the units should be arranged so as to form a symmetrical layout with respect to the interior architectural construction, but in no case should the above spacing be exceeded.

When the mounting height and spacing distance between units is twelve feet or less, either



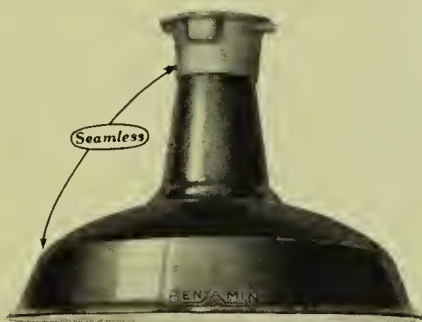
*Benjamin "Type 79" Glassteel Diffuser—
Catalog No. 9202*

Catalog Number 7202 Pendant Type or 9202 Ceiling Type Glassteel Diffuser, will be found satisfactory. Using 300 watt standard lamps, a lighting intensity of twelve foot candles will be obtained on the working plane.

Where the mounting height or spacing distance ranges from twelve to sixteen feet, the 500 watt lamp, used in the same size units previously recommended, will furnish the desired illumination.

Wood Working Departments

In the Woodworking Departments of the plant, the nature of the manufacturing operations causes unusual quantities of dust and flyings to be suspended in the air. Here the dust tight combination of Benjamin "Type 79" RLM Dome Reflectors, either Catalog Numbers 7188 pendant type or 9188 ceiling



*Benjamin "Type 79" RLM Dome Reflector—
Catalog No. 9188*

type, and the Benjamin Dust Tight Cover Catalog Number 6418, is particularly ap-

propriate. These reflectors are of seamless one-piece construction, open only at the bottom, while the cover consists of a clear glass disc, felt gasket and metal retaining band which slips over the beaded edge of the reflector.

With the Dust Tight Cover, the lamp and reflecting surfaces of the unit are protected from accumulations of dust and dirt and it is necessary only to wipe off the smooth outer surface of the glass disc to restore the unit to maximum lighting efficiency.

For a more complete description of Benjamin Dust Tight Covers, see page 27.

Units should be mounted and spaced in the same manner as recommended for "Machine Shop Installation" in the previous chapter.

As previously explained, where the mounting height of the units is twelve feet or under, the 300 watt white bowl lamp will be satisfactory. However, where the units are mounted more than twelve feet above the floor, but not more than sixteen feet, the 500 watt lamp must be used. Either 300 or 500 watt lamps may be used in the fixtures recommended.

Doping Rooms

From the standpoint of safety, the doping of the wing fabrics should be carried on in



*Benjamin Gas and Vapor Proof Dome Reflector—
Catalog No. 1586*

fire-proof rooms which are separated from the rest of the factory.

These doping rooms come under the general heading of "Hazardous Locations" and the National Board of Fire Underwriters specify that only approved fixtures—like the Benjamin line of Gas and Vapor Proof Lighting Equipment—can be installed in this class of location.

The Benjamin Gas and Vapor Proof Dome Reflector, Catalog Number 1586, is the proper size unit for this service and is described on page 26. It should be installed according to the mounting and spacing data given under the "Lighting of Machine Shops," page 22. A complete description of Benjamin Gas and Vapor Dome Reflector is given on page 26.

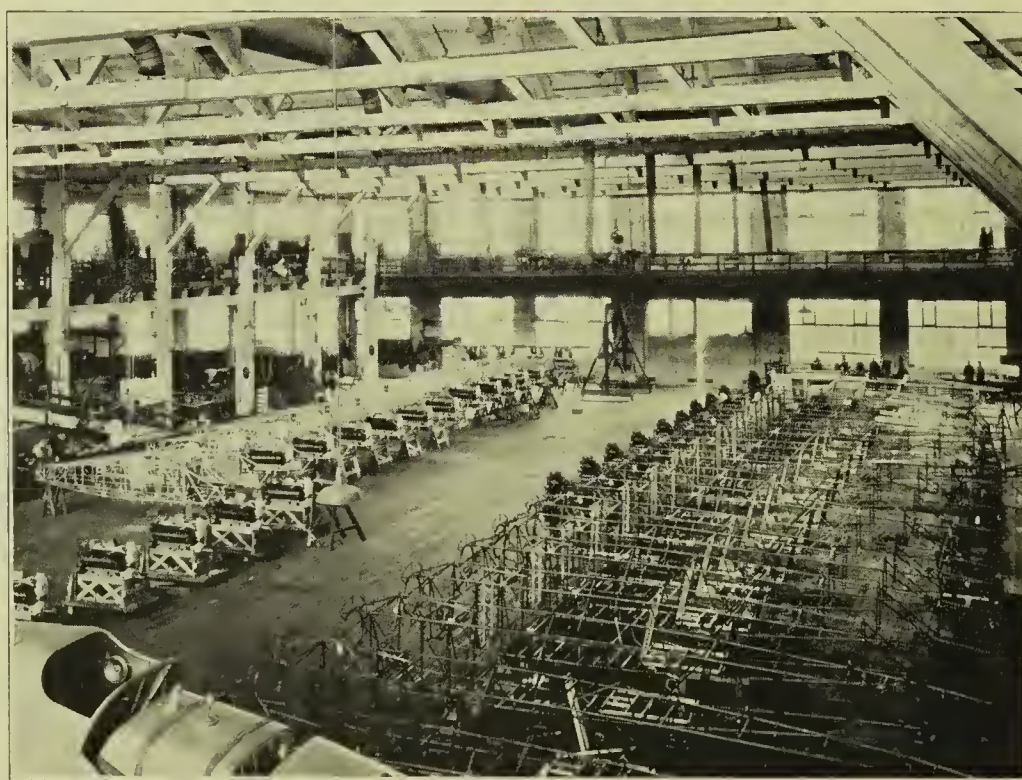
Assembly Operations

The Benjamin "Type 79" Glassteel Diffuser, with its glass diffusing bowl, is more effective for lighting assembly operations than ordinary reflectors with open light sources. The direct rays from the open reflector cause annoying specular reflections on the corrugated bodies of the all-metal planes and the smooth varnished surfaces of the

other types which can be eliminated by the diffusing qualities of the Glassteel Diffusers. Units should be mounted approximately twenty feet above the floor with the spacing between units not exceeding twenty feet. Catalog Number 7203 Units, equipped with 750 watt lamps, are recommended, but wiring provisions should be made so 1000 watt lamps can be substituted in the same size reflector at a later date.

As mentioned under the "Lighting of Hangar Interiors" the lighting units should be staggered in the bays in order to prevent the large wing areas of the planes from cutting off the light from an entire row of units at one time.

To provide sufficient illumination on the vertical surface of the plane, the overhead lighting system must be supplemented by an installation of side mounting reflectors mounted approximately fifteen to twenty feet apart. The Benjamin Elliptical Angle Reflector Number 5537, with 300 or 500 watt lamps, should be used for this purpose and installed as described under the "Servicing of Large Planes" on pages 7 and 8.



Day View of Benjamin RLM Dome Reflector Installation in Assembly Department of Boeing Airplane Company Plant at Seattle, Washington.

Benjamin Airport Lighting Equipment

"Type 79" Overhead Lighting Units

National Electrical Code Standard



"Type 79" Glassteel Diffuser

At the Right
New "Type 79"
Bayonet Lock
Which Allows
Reflector, Lamp
and Globe to
Come Down as
a Complete Unit
For Easy Cleaning
on the Floor



A new construction principle which reduces cleaning and maintenance costs by allowing the reflector, lamp and globe to be taken down as a complete unit for easy cleaning on the floor.

Each unit consists of two complete assemblies: a hood with a wiring terminal base and the reflector assembly including the lamp holder and globe.

Installation is unusually easy. Wiring connections are made to the hood terminal base and then the reflector is attached by inserting the bayonet heel on top of the reflector into the hood and moving it less than a quarter turn to the right. This movement establishes a strong mechanical connection and positive electrical contact between the two assemblies.

Glassteel Diffuser

For uniform glareless illumination of upright and flat surfaces. Apertures in top of reflector permit upward passage of sufficient light to illuminate upper-room areas. An unusually neat appearing unit.

CRYSTEEL porcelain enameled steel reflector—finished white inside and outside with porcelain lamp holder, bayonet attaching plate and opal glass globe. Cadmium plated hoods: pendent type tapped for 1/2 inch conduit; ceiling type fits four inch standard outlet boxes of 1 1/2 inches or more depth.

SIZE OF LAMP WATTS	PENDENT HOOD FIXTURE CAT. NO.	CEILING HOOD FIXTURE CAT. NO.	LIST PRICE	DIAM. OF REFL.	SHIPPING WEIGHT LBS. STD. PKG.	STD. PKG.
150, 200	7201	9201	\$ 9.25	18"	34	4
300, 500	7202	9202	12.75	20"	40	4
750, 1000	7203		18.75	24"	40	2

Schedule 2 discounts apply

R L M Dome Reflector

For good general illumination of upright and flat surfaces. 17 1/2 degree angle of cut-off shields eyes from direct glare. R L M Standard.

Seamless, one piece CRYSTEEL porcelain enameled steel reflector—finished white inside, green outside—with porcelain lamp holder and bayonet attaching plate. Hoods are identical with those described for Glassteel Units above.

SIZE OF LAMP WATTS	PENDENT HOOD FIXTURE CAT. NO.	CEILING HOOD FIXTURE CAT. NO.	LIST PRICE	DIAM. OF REFL.	SHIPPING WEIGHT LBS. STD. PKG.	STD. PKG.
100	7182	9182	\$3.60	12"	34	10
150	7184	9184	3.80	14"	39	10
200	7186	9186	4.60	16"	45	10
300, 500	7188	9188	5.70	18"	35	5
750, 1000	7190	9190	7.60	20"	41	5

Schedule 2 discounts apply

Shock-Absorbing Lamp Holders

Shock absorbing lamp holders—an exclusive feature of Benjamin Equipment—preserve lamp life by counteracting vibration. Furnished on both R L M and Glassteel Units in place of the standard rigid type lamp holders at an advance of \$.10 in list price.



Pendent Type of
"Type 79" R L M Dome
Reflector

Benjamin Airport Lighting Equipment

National Electrical Code Standard Socket

Overhead Lighting Units

R L M Dome Reflector-Socket



Catalog No. 5642

For general illumination of outdoor and indoor areas. RLM Standard. $17\frac{1}{2}^{\circ}$ angle of cut-off. Strong—weatherproof—easily wired.

Seamless, one-piece CRYSTEEL porcelain enameled steel reflector—finished green outside, white inside—with separable fitting, tapped for $\frac{1}{2}$ inch conduit, and key-

less porcelain socket. Also supplied with special sockets at the following advances in list price: pull chain, medium base, \$0.80; self-locking, medium base, \$0.40; shock-absorbing, for preserving lamp life, in medium or mogul base, at \$0.10.

SIZE OF LAMP, WATTS	CAT. No.	LIST PRICE	DIAM. OF REFLECTOR, INCHES	NET WEIGHT, LBS., EACH	STD. PKG.
50, 60	5640	\$3.20	12	$2\frac{1}{4}$	10
100	5641	3.30	12	$2\frac{3}{8}$	10
150	5642	3.50	14	$3\frac{1}{4}$	10
200	5643	4.30	16	$3\frac{5}{8}$	10
300, 500	5644	5.30	18	$4\frac{1}{4}$	5
750, 1000	5645	7.20	20	$5\frac{5}{8}$	5

Schedule 2 discounts apply

Gas and Vapor Proof Dome Reflector



Catalog No. 1582

For general illumination of doping rooms or similar locations where hazardous atmospheric conditions prevail. These fixtures are of approved vapor proof construction. The lamp is enclosed by a heavy glass globe which is gasket sealed to threaded one-piece reflector neck. There are no openings for the passage of gases or vapors.

CRYSTEEL acid-resisting porcelain enameled steel reflector—finished green outside, white inside—with glass screw globe, separable fitting tapped for $\frac{1}{2}$ inch conduit, and keyless porcelain socket. Supplied with shock-absorbing sockets at an advance of \$0.10 in list price.

SIZE OF LAMP, WATTS	CAT. No.	LIST PRICE	DIAM. OF REFLECTOR, INS.	FINISH OF GLOBE	WT., LBS., STD. PKG.	STD. PKG.
100	1582	\$ 6.00	12	Clear	40	10
150	1581	6.75	14	Clear	50	10
200	1586	8.25	16	Clear	31	5
300, 500	1588	10.75	18	Clear	39	5

Schedule 4 discounts apply

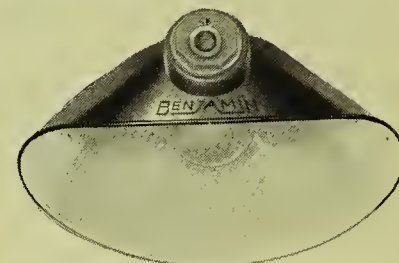
Side Lighting Units

Sign Reflectors



Side View

Catalog No. 5570



Front View

Catalog No. 5570

Suitable for floodlighting sides of buildings, signs, poster panels, and similar surfaces. Wide vertical and lateral distribution. Can be mounted directly out or up from a surface, eliminating the use of goosenecks and similar attachments. Inconspicuous—easily installed—strong, and weatherproof.

CRYSTEEL porcelain enameled steel reflector—finished green outside, white inside—heavy separable fitting, tapped for $\frac{1}{2}$ inch conduit, and keyless porcelain socket. Also supplied with self-locking socket at \$0.40 advance in list, or shock absorbing socket at \$0.10 advance in list.

SIZE OF LAMP, WATTS	CAT. No.	LIST PRICE	DIAM. INCHES	SHIP. WT., LBS. STD. PKG.	STD. PKG.
100, 150	5570	\$4.20	$13\frac{1}{4}$	32	9
150, 200	5571	4.80	$13\frac{1}{4}$	35	9

Schedule 2 discounts apply

Elliptical Angle Reflector

Suitable for floodlighting sides of large buildings, large signs, and to supplement the overhead lighting system in repair areas and construction shops. Effectively illuminates horizontal and vertical surfaces. Lighting characteristics are similar to the Sign Reflector described above.

CRYSTEEL porcelain enameled steel reflector—finished green outside, white inside—heavy separable fitting, tapped for $\frac{3}{4}$ inch conduit, and keyless porcelain socket.

Benjamin Elliptical Angle Reflectors can be furnished with a shock-absorbing socket, which preserves life by counteracting vibration. Supplied when specified at an advance of \$0.10 in list price.



Side View

Catalog No. 5537

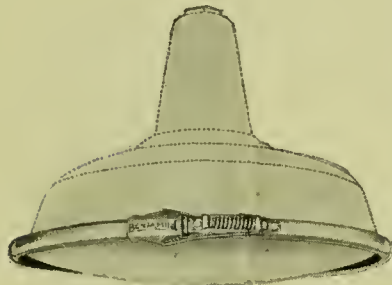
SIZE OF LAMP, WATTS	CAT. No.	LIST PRICE	DIAM. INCHES	NET WEIGHT, LBS., EACH	STD. PKG.
300, 500	5537	\$8.70	$19\frac{7}{8}$	$3\frac{3}{4}$	5
750, 1000	5538	9.00	$20\frac{7}{8}$	$4\frac{1}{8}$	5

Schedule 2 discounts apply

Benjamin Airport Lighting Equipment

*National Electrical Code Standard

*Dust Tight Glass Cover



Catalog No. 6418

The Benjamin Dust Tight Cover attaches to Benjamin R L M and Bowl Reflectors and affords an economical method of cleaning. It is necessary only to wipe off the smooth outer surface of the glass disc as compared with cleaning the lamps and reflecting surfaces of open reflector equipment. Easily installed—light in weight.

Construction—Cadmium plated steel retaining band with locking lever, felt gasket and clear glass disc.

CAT. NO.	LIST PRICE	DIAM. OF REFL. COVER WILL FIT	NET WEIGHT LBS. EACH	STD. PKG.
6409	\$3.20	9"	1 1/4	5
6410	3.30	10"	1 1/2	5
6412	3.75	12"	2	5
6414	4.25	14"	2 1/4	5
6416	5.00	16"	3	5
6418	5.75	18"	4 1/4	5
6420	9.50	20"	4 3/4	5

Schedule 2 discounts apply

*Bowl Reflector-Socket

For lighting Wind Bags, Wind Tees and similar objects around the airport.

CRYSTEEL porcelain enameled steel reflector—finished green outside, white inside—with separable fitting and keyless porcelain socket. Also supplied with shock-absorbing socket, for lengthening lamp life, in place of the regular rigid socket, at \$0.10 advance in list.



Catalog No. 6189

SIZE OF LAMP, WATTS	CATALOG NUMBER	LIST PRICE	DIAMETER OF REFL.	NET WEIGHT LBS. EACH	STD. PKG.
100	6161	\$3.10	8 1/4"	1 7/8	10
150	6189	3.30	9"	2	10

Schedule 2 discounts apply

*Emblem Sign Reflector



Cat. No. 5736

For intensive lighting of circular or nearly circular small signs. Easily wired and installed. No goosenecks required.

CRYSTEEL porcelain enameled steel reflector—finished green outside, white inside—with cadmium plated hood and keyless receptacle.

SIZE OF LAMP, WATTS	CATALOG NUMBER	LIST PRICE	SHIPPING WT., LBS. STD. PKG.	STD. PKG.
60	5736	\$2.05	23 1/2	10
100	5738	2.10	24	10

Schedule 2 discounts apply

*The Projectolite

For uniform lighting of straight or rounded surfaces from a grazing angle. Ideal for flood lighting obstructions, signs, etc. The powerful flood light beam of the Projectolite is broadened and flattened by a special lens which directs the greater part of the light to a point farthest from the light source and a correspondingly smaller amount to the points near the reflector. The result is even illumination over the entire surface.



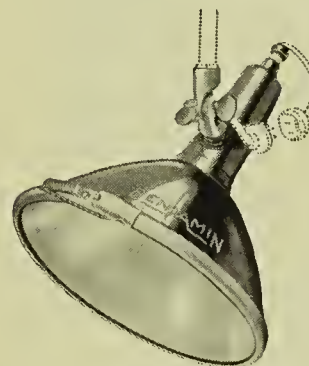
Catalog No. 5613

Vapor proof construction with all wiring enclosed. Easily adjusted and easily cleaned. Copper reflector, chromium plated inside, green lacquer outside; heat resisting glass lens. Furnished wired with 10 foot leads.

SIZE OF LAMP, WATTS	CATALOG NUMBER	LIST PRICE	DIAM.	SHIPPING WEIGHT, LBS. STD. PKG.	STD. PKG.
300	5613	\$20.00	12 1/2	26	2

Schedule 4 discounts apply

*The Intensifier



Catalog No. 5604

A supplementary lighting unit designed to illuminate small areas to higher intensities than required for general work in that particular location. Ideal for lighting close repair and inspection work around the repair and storage areas of hangars and for fine machine work around airplane manufacturing plants can be mounted directly above or off to the side of the surface to be illuminated. Easily installed—out of the line of vision—easily maintained.

Reflector is of heavy gauge metal with steel neck containing focusing apparatus and keyless easy-to-wire socket. Dust Tight Cover seals interior of unit. Inside finish is chromium; outside is green lacquer.

SIZE OF LAMP, WATTS	CATALOG NUMBER	LIST PRICE	SHIPPING WEIGHT, LBS., STD. PKG.	STD. PKG.	GLASS COVER
60, 100	5603	\$11.75	6	1	Clear
150, 200	5604	15.00	10	1	Frosted

Schedule 4 discounts apply

45° Ball Fixture Aligner

Combination outlet box cover and ball fixture aligner which allows fixture to hang plumb from sloping ceilings. Attaches to 3 1/4 and 4 inch standard boxes and is tapped for 1/2 inch pipe.

CATALOG NUMBER	LIST PRICE	SHIPPING WEIGHT, LBS., STD. PKG.	STD. PKG.
3380	\$0.30	6 1/2	10

Schedule 4 discounts apply

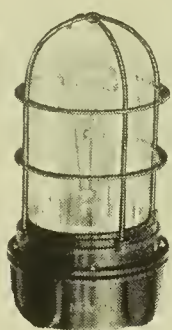


Benjamin Airport Lighting Equipment

*National Electrical Code Standard

*Heavy Duty Water Tight Fixture

In Std. 4½ inch
Water Tight Outlet Box



No. 6800

For use as a warning light on wind bag and tee supports. A thoroughly water-proof unit designed to stand up under severe mechanical service and unfavorable atmospheric conditions. Heavy brass guard protects the glass lamp enclosing globe from breakage. Supplied with molded composition receptacles and standard 4½ inch water tight outlet boxes, in either brass or iron.

Boxes are regularly furnished not tapped for conduit entrance. Specify tapping on order; see information in adjoining column.

Crystal, rough inside; ruby (navy standard) or blue (navy standard) globes can be supplied in place of clear glass globes at prices quoted upon application.

SIZE OF LAMP, WATTS	CATALOG NO.	LIST PRICE	TYPE OF RECEPT.	KIND OF BOX	NET WT., LBS. EACH
25 to 100	6800	\$6.75	Keyless	Brass	4⅛
	6801	6.05	Keyless	Iron	4⅛
	6802	8.15	Key	Brass	4¼
	6803	7.45	Key	Iron	4¼

Schedule 10 discounts apply

*Heavy Duty Water Tight Fixture

With Cast Body Tapped for
½ inch Conduit Suspension



No. 6830

For boundary marking, obstruction lighting and similar uses around the airport. The construction is similar to the fixtures described above except that a cast brass body, tapped for ½ inch conduit suspension, is provided in place of an outlet box. Heavy brass guard protects the globe from breakage. Molded composition receptacle. Crystal, rough inside; ruby (navy standard) or blue (navy standard) globes will be furnished in place of the clear glass globes regularly supplied, at prices quoted upon application.

SIZE OF LAMP, WATTS	CATALOG NUMBER	LIST PRICE	TYPE OF RECEPT.	NET WEIGHT LBS. EACH
25 to 100	6830	\$6.10	Keyless	3⅛
25 to 100	6832	7.50	Key	3¼

Schedule 10 discounts apply

*Heavy Duty Water Tight Boxes

With Plain Cover and Gasket



No. 6700



No. 6705

Standard depth boxes are provided with side boss for plunger key control and accommodate Benjamin Connecting Blocks, Receptacles and Switches. Deep boxes are furnished in keyless type only and accommodate Benjamin Connecting Blocks and Keyless Receptacles.

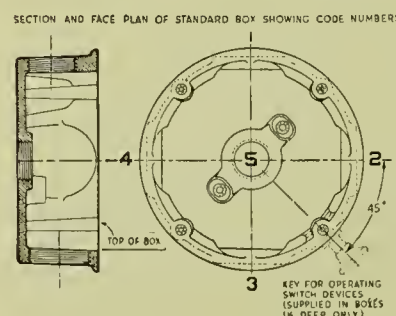
All boxes have mounting bosses in bottom tapped for 8/32 screws and edges are tapped for 10/32 inch screws, furnished to fasten cover. Gasket seals joint between cover and box. Key boxes have water tight stuffing and plunger key.

Boxes are regularly furnished not tapped for conduit entrance—see tapping instructions below.

CAT. NO.	LIST PRICE	TYPE OF BOX	MATERIAL	DESCRIPTION	NET WT. LBS. EACH
6700	\$2.05	Keyless	Brass	Box, Cover and Gasket	2¼
6701	1.05	Keyless	Iron	Box, Cover and Gasket	2¼
6702	2.55	Key	Brass	Box, Cover and Gasket	2⅜
6703	1.55	Key	Iron	Box, Cover and Gasket	2⅜
6900	1.30	Keyless	Brass	Box Only	1¾
6901	.60	Keyless	Iron	Box Only	1¾
6902	1.80	Key	Brass	Box Only	1⅞
6903	1.10	Key	Iron	Box Only	1⅞
6920	.65	.....	Brass	Cover Only	1½
6921	.35	.....	Iron	Cover Only	1½
6945	.10	.....	Rubber	Gasket Only	1/32

Schedule 10 discounts apply

How to Specify Tapping



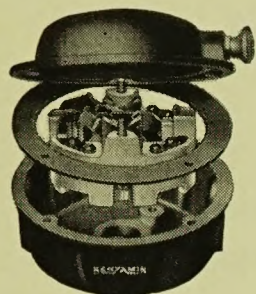
Benjamin water tight outlet boxes have four bosses, spaced 90° which can be tapped for ½, ¾, or 1 inch conduit. A ½ or ¾ inch entrance may be tapped in bottom of box. No charge is made for tapping when the sizes and number of conduit entrances accompany order.

For convenience in specifying, a simple code has been adopted under which entrances as shown in the diagram above, are marked for position only as 1, 2, 3, 4, and 5. In specifying, start at entrance 1 and give size of tapping desired. Similarly, specify the size of each entrance in turn.

Benjamin Airport Lighting Equipment

*National Electrical Code Standard Socket

*Heavy Duty 30 Amp. W.T. Switch



Cat. No. 6878

With Std. 4½ inch
Water Tight Outlet Box
30 Amps., 125 Volts; 20 Amps.,
250 Volts.

This sturdy heavy duty double pole toggle switch is designed for the severest type of service, either in or out of doors. Thoroughly weather-proof construction, consisting of cast brass or iron standard 4½ inch water tight outlet box with brass cover, which contains water-tight stuffing box and plunger key.

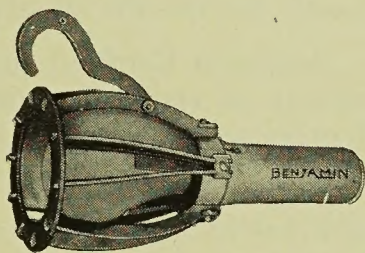
Heavy duty double pole switch with plunger key control is attached to cover by several supporting screws. All joints are gasket sealed. Boxes are regularly furnished not tapped for conduit. Specify tapping on order; see directions in adjoining column.

CAT. NO.	LIST PRICE	KIND OF BOX	DESCRIPTION	NET WT., LBS. EACH
6878	\$6.40	Brass	Complete with box	3 3/8
6877	5.70	Iron	Complete with box	5 1/4
6876	5.00	Brass	Cover with switch only	1 3/4
6879	3.00	.....	D. P. Switch, less key	5/8

Schedule 10 discounts apply

*Fibre Hand Portable

This strong light weight portable is shock proof. Socket is mounted in such a manner that the springs which protect the lamp from breakage are very effective. Has varnished hard wood handle and strong fibre guard and hook. Will not roll when placed on a flat surface. Adjustable fibre half shade shields user's eyes from glare. Takes 25 to 60 watt lamps.



Catalog No. 158

CATALOG NUMBER	LIST PRICE	DESCRIPTION	NET WT., LBS., EACH	STD. PKG.
158	\$2.30	Keyless type	1/2	10
160	2.40	Key type	1/2	10
151	1.40	Fibre guard only	1/8	10

Schedule 6 discounts apply

Iron Goosenecks

Without Fitting



Cat. No. 5037

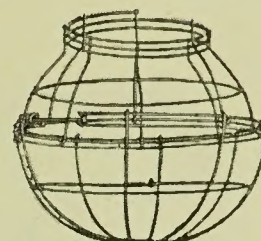
Iron goosenecks for supporting reflectors, recommended for use on wind indicator stand.

CAT. NO.	LIST PRICE	SIZE IN INCHES	WT., LBS. STD. PKG.	STD. PKG.
5036	\$0.75	30x1½	23	10
5037	1.15	40x¾	55	10

Schedule 4 discounts apply

Globe Guard

For Benjamin "1500 Line" Gas and Vapor Proof Lighting Equipment



Cat. No. 1428

A strong two-piece steel wire guard which offers protection to the glass enclosing globes of Benjamin "1500 Line" Gas and Vapor Fixtures, catalog numbers 1584 and 1586. The guard screws onto the outside threaded neck of the fixture, entirely encloses the glass globe, and lessens the danger of breakage. The two piece construction of the guard makes for easy attachment and easy removal for relamping.

Guard is of heavy gauge steel wire with welded joints. All parts are heavily tinned to prevent corrosion.

CATALOG NUMBER	LIST PRICE	FOR FIXTURES	NET WEIGHT, LBS., EACH	STD. PKG.
1428	\$1.60	Cat. No. 1584	5/8	10
1430	2.50	Cat. No. 1586	7/8	10

Schedule 2 discounts apply

*Benco Weather-Proof Sockets



No. 4200



No. 4335



No. 4207

Sturdy metal-clad porcelain sockets for indoor or outdoor service. Highly insulated, rugged interior with strong metal casing. Thread on casing may be used for attaching Benjamin Type "S" shade holder reflectors or Benjamin Type "S" holders listed in Benjamin catalog No. 24.

Keyless Type

660 Watts—600 Volts—Medium Base

Sockets listed are tapped for ½ inch conduit. Sockets tapped ¾ inch size are listed in Benjamin catalog No. 24.

CATALOG NUMBER	LIST PRICE	FINISH	WEIGHT, LBS., STD. PKG.	STD. PKG.
4200	\$0.70	Pol. Aluminum	3	10
4202	.85	Brushed Brass	3	10
4204	.70	Natural Copper	3	10

Bushed for Drop Cord up to ½ Inch

4335	\$0.70	Pol. Aluminum	3	10
4336	.85	Brushed Brass	3	10
4337	.70	Natural Copper	3	10

Pull Chain Type

Tapped for ½ Inch Conduit
660 Watts—250 Volts—Medium Base

4225	\$1.40	Pol. Aluminum	3 1/4	10
4207	1.40	Brushed Brass	3 1/4	10
4236	1.40	Natural Copper	3 1/4	10

Schedule 3 discounts apply

An Assurance of Quality and Satisfactory Service



*All Lighting Equipment Listed on Pages
Twenty-five to Twenty-nine Carry
This Quality Label*

Look for This Label of Quality

Use this label as a guide in the selection of your lighting equipment. It is the quality symbol of an organization with a score of years' experience in producing quality lighting equipment. It is an assurance of lasting reliability and satisfactory performance from your lighting system. It is your one means of identifying lighting equipment that gives maximum results.

Points of Certification

Benjamin Certified Reflectors are designed in accordance with best illuminating engineering practice to direct the maximum light of suitable quality on the surfaces to be illuminated.

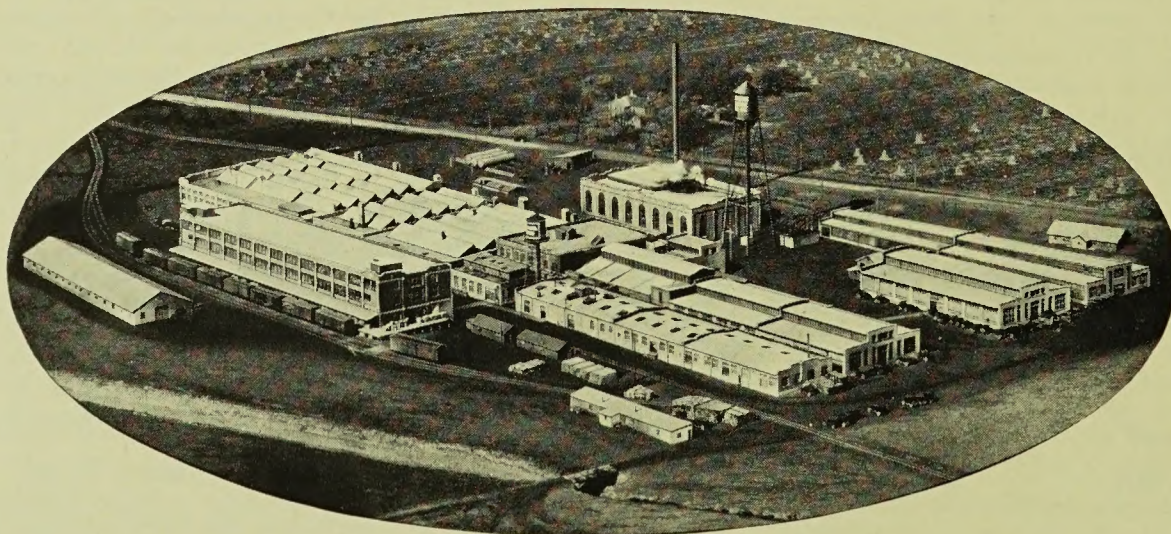
When installed in the locations for which they are recommended, in the manner described in this book, they assure satisfactory lighting results.

Benjamin Certified Reflectors are finished in

CRYSTEEL Porcelain Enamel—a reflecting surface which exceeds the standard of practice.

Benjamin Certified Reflectors are designed in a variety of styles to meet the lighting and service requirements of every type of location.

Benjamin Certified Reflectors are carefully constructed to insure lasting service and reliable performance.



*The Home of Certified by Benjamin Lighting Products,
Located at Des Plaines (Chicago Suburb), Ill.*

